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California Marketplace E85 Specification - Alliance Fuels Group Comments

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California Phase 3 Reformulated Gasoline (CaRFG3) E10 Certification Gasoline and
Marketplace E85 Workshop

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Alliance of Automobile Manufacturers

California Marketplace Ethanol Fuel “E85”

The Alliance recognizes that the Air Resources Board’s work to create an E85 Marketplace Fuel Quality specification is a difficult task, particularly when balancing the State’s evaporative fuel emissions needs, cost, fuel supply and vehicle performance demands.

The Alliance will focus its comments today on the Implications of Lowering the E85 RVP Limits relative to Vehicle Performance and the need for a lower Sulfur limit for the California marketplace E85.

CRC E85 Vehicle Driveability Studies - Influence of RVP

In 2008 and 2009, two Coordinating Research Council (CRC) programs studied vehicle Cold-Start and Warm-up Performance as a function of Ethanol Content (E85, E75 and E0) and Reid Vapor Pressure (RVP)

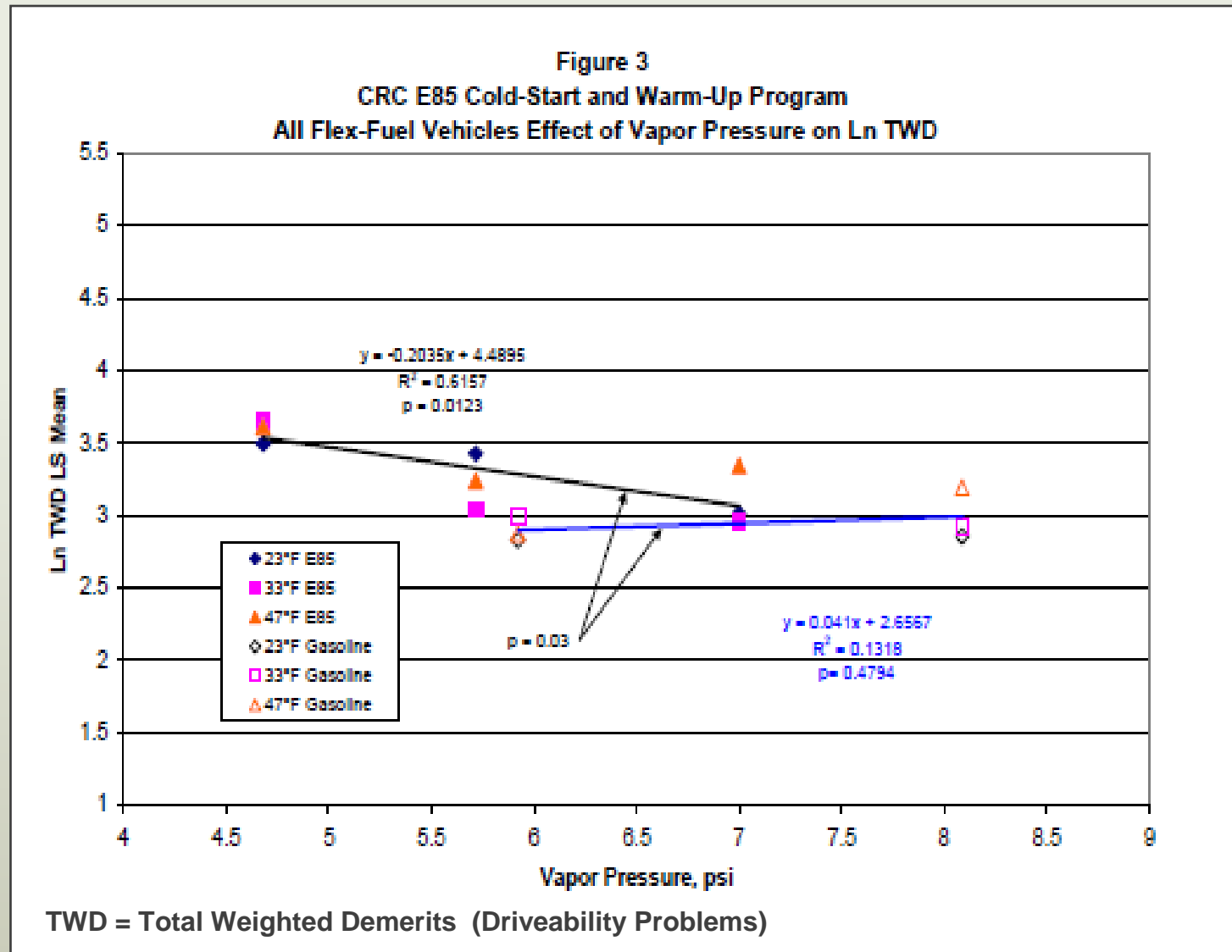
- **Conclusion - Reduction of RVP minimums increased Vehicle Driveability Problems.**
- For E85 Fuels, cold-start and warm-up improved with:
 - Increasing Ambient Temperature
 - Increasing Vapor Pressure
 - Increasing Hydrocarbon Content
- Lower Vapor Pressure Fuels
 - Increased engine cranking time to start, which yields higher HC tailpipe emissions
- CRC Report References Support - Next 2 slides

CRC E85 Vehicle Driveability Studies - Influence of RVP

References:

CRC Report No. 652 - 2008 CRC Cold-Start and Warm-Up E85 and E15/E20 Driveability Program (E85 Classes 1 & 2) – Oct. 2008

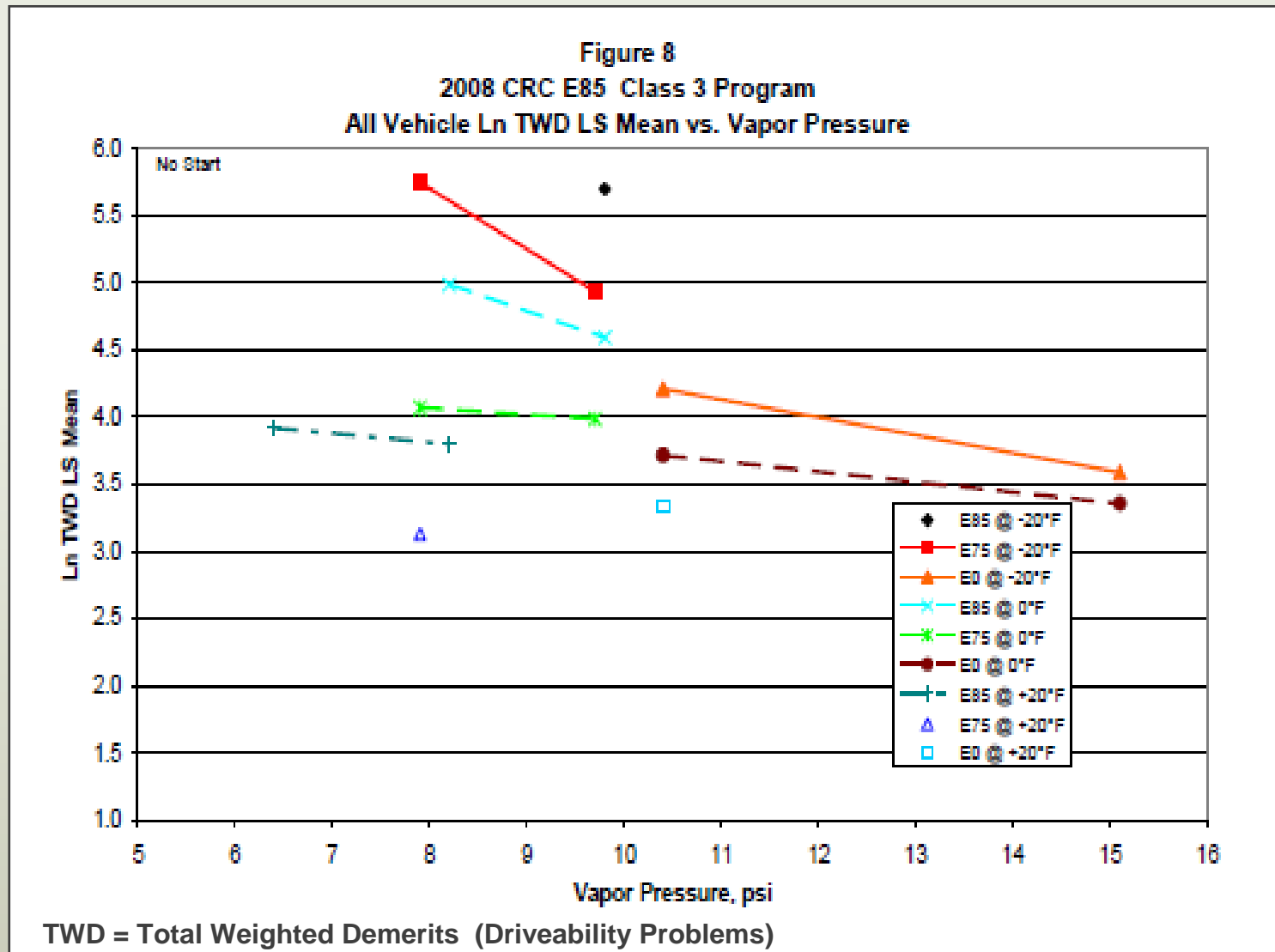
CRC Report No. 652 - E85 Classes 1 & 2 (ASTM D5798)



CRC E85 Vehicle Driveability Studies - Influence of RVP

CRC Report No. 654 - 2008 CRC Cold-Start and Warm-up E85 Cold Ambient Temperature Driveability Program - July 2009

CRC Report No. 654 - E85 Class 3 (ASTM D5798)



California E85 Marketplace Specification - Sulfur

- Current California E85 Sulfur standard of 40 ppm is too high to enable optimal performance of current vehicle exhaust systems
- In all Vehicle Emissions Hardware Technology cases below, reducing sulfur improves vehicle emissions

There has been extensive testing done on the impact of sulphur on vehicle emissions. The following studies (see table) indicate the emission reductions that occur with different vehicle technologies as sulphur is reduced from the 'high' sulphur gasoline to the 'low':

Table 2: Impact of sulphur on emissions

Study	Vehicle Technology	Sulphur Range (ppm)		Emission Reduction, % (high to low sulphur)		
		high	low	HC	CO	NO _x
AQIRP	Tier 0	450	50	18	19	8
EPEFE	EURO 2+	382	18	9 (43*)	9 (52*)	10 (20*)
AAMA/AIAM	LEV & ULEV	600	30	32	55	48
CRC	LEV	630	30	32	46	61
JARI	1978 Regulations	197	21	55	51	77
Alliance/AIAM	LEV/ULEV	100	30	21	34	27
	LEV/ULEV	30	1	7	12	16
JCAP	DI/NO _x cat.	25	2			37

* Reduction achieved during hot EUDC (extra-urban) portion of test.

Reference: World Wide Fuel Charter, 4th Ed., 2006, pg. 16

California E85 Marketplace Specification - Alliance Proposal

- ARB should maintain a common E85 Specification with ASTM D5798 in all aspects, except Sulfur
- Sulfur - 15 ppm or lower is necessary for optimal tailpipe emissions. Future CARBOB Cap limit in 2012 is 20 ppm (See Note B)
- RVP requirements require California to have a high vapor pressure blending stock be available year round

	Current ARB E85 Spec.	Proposed ASTM D5798 Spec, "Ethanol Fuel for Flexible-Fuel Automotive Spark-Ignition Engines"			Proposed Alliance California Marketplace E85 Spec.		
Properties		Class 1 ^A	Class 2	Class 3	Class 1 ^A	Class 2	Class 3
Ethanol, volume %	79 vol. %, (min.)	68-83	68-83	68-83	68-83	68-83	68-83
Other Alcohols	2 vol% (max.)	---	---	---	---	---	---
Hydrocarbons & Aliphatic Ethers	15.21 vol. %	---	---	---	---	---	---
Vapor pressure, kPa (psi)	6.5 to 8.7 psi; Class A, A/B, B/A, B 7.3 to 9.4 psi; Class B/C, C/B, C, C/D, D/C 8.7 to 10.2 psi; Class D, D/E, E/D, E	38-59 (5.5-8.5)	48-65 (7.0-9.5)	66-83 (9.5-12.0)	38-59 (5.5-8.5)	48-65 (7.0-9.5)	66-83 (9.5-12.0)
Methanol, volume %, max	---	0.5			0.5		
Sulfur, max, mg/kg	40	80			15 ^B		
Acidity, (as acetic acid CH ₃ COOH), mass % (mg/L), max	0.007	0.005 (40)			0.005 (40)		
Solvent-washed gum content, max, mg/100 mL	5	5			5		
pH _c	---	6.5 to 9.0			6.5 to 9.0		
Water, max, mass %	1.25	1			1		
Unwashed gum content, max, mg/100 mL	---	20			20		
Inorganic chloride, max, mg/kg	---	1			1		
Total Chlorine as Chloride, mass %, max.	0.0004	---			---		
Copper, max, mg/L	0.07	0.07			0.07		
Lead, mg/L, max.	2	---			---		
Phosphorus, mg/L, max	0.2	---			---		
Total Particulates, mg/L, max.	5	---			---		
Appearance	Free of turbidity, suspended matter and sediment.	This product shall be visibly free of suspended or precipitated contaminants (clear and bright). This shall be determined at ambient temperature or 21°C (70°F), whichever is higher.			This product shall be visibly free of suspended or precipitated contaminants (clear and bright). This shall be determined at ambient temperature or 21°C (70°F), whichever is higher.		
Note (A): See Volatility class criteria of Section 4.1.1 of proposed ASTM D5798-XX specification							
(B): 15 ppm ~ (0.68 x 10ppm Ed100 + 0.32 x 20 ppm CARBOB)							

The Alliance thanks you for your consideration.

BMW Group



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